

Herophilus

Herophilus, of Chalcedon (c.330–260 BC), Alexandrian physician, pupil of Praxagoras of Cos. He and Erasistratus were the only ancient scientists to perform systematic scientific dissections of human cadavers. If the controversial but unequivocal evidence of several ancient authors is to be trusted, Herophilus also performed systematic vivisectionary experiments on convicted criminals—experiments made possible, according to Celsus, only by royal intervention (see VIVISECTION). Herophilus' numerous anatomical achievements included the discovery of the nerves. He distinguished between sensory and 'voluntary' (motor) nerves, described the paths of at least seven pairs of cranial nerves, and recognized the unique characteristics of the optic nerve. The first to observe and name the *calamus scriptorius* (a cavity in the floor of the fourth cerebral ventricle), he called it **κάλαμος** ('reed pen') because it resembles the carved out groove of a writing pen. His dissection of the eye yielded the distinction between cornea, retina, iris, and choroid coat.

From his *Anatomica* 1 the first reasonably accurate description of the human liver is preserved. He also identified and named the duodenum (**δωδεκαδάκτυλον**). From *Anatomica* 3 fragments concerning the reproductive parts are extant. Using the analogy of the male parts, he discovered the ovaries, which he called the female 'twins' or testicles (**δίδυμοι**, 'twins', being a traditional term for the male testicles). He likewise discovered the Fallopian tubes, but without determining their true course and function. In the male, he meticulously identified previously unknown parts of the spermatic duct system. *Anatomica* 4 seems to have dealt with the anatomy of the vascular system. Adopting Praxagoras' distinction between veins and arteries, he added basic observations on the heart valves, on the chambers of the heart, and on various vascular structures. The *torcular Herophili*, a confluence of several great venous cavities (sinuses) in the skull, was first identified and named (**ληνός**, 'wine vat') by Herophilus.

In his physiopathology, he appears to have accepted the traditional notion that an imbalance between humours or moistures in the body is a principal cause of disease, but he insisted that all causal explanation is provisional or hypothetical. The 'command centre' of the body is in the fourth cerebral ventricle (or in the cerebellum, which is indeed the region responsible for all muscular co-ordination and for the maintenance of equilibrium). From the brain, sensory and motor nerves proceed like offshoots. Neural transmissions, at least in the case of the optic nerve, are said to take place by means of *pneuma*, which is ultimately derived from the air through respiration. Respiration is attributed to the natural tendency of the lungs to dilate and contract through a four-part cycle.

His *On Pulses* (**Περὶ σφυγμῶν**), became the foundation of most ancient pulse theories. A faculty (**δύναμις**) flowing from the heart through the coats of the arteries causes the regular dilation (**διαστολή**) and contraction (**συστολή**) of the arteries, which thus 'pull', transport, and distribute a mixture of blood and

pneuma from the heart throughout the body (the veins, by contrast, contain only blood). Using metrical analogies, he described the relations between diastole and systole as successively assuming pyrrhic, trochaic, spondaic, and iambic rhythms, viz. in infancy, childhood, adulthood, and old age. He had sufficient faith in the diagnostic value of the pulse to construct a portable clepsydra, adjustable for the patient's age, to measure the frequency of his patient's pulses.

Reproductive physiology and pathology are well represented in his extant fragments. His *Midwifery* (*Μαιευτικόν*) apparently tried to demystify the uterus by claiming that it is constituted of the same material elements as the rest of the body and is governed by the same faculties. Although certain 'affections' (*πάθη*) are experienced only by women (conception, parturition, lactation), there is no disease peculiar to women. He also discussed the normal duration of pregnancy, causes of difficult childbirth, and whether the foetus is a living being. Tertullian charges him with possession of an instrument known as 'foetus-slayer' (*έμβρυοσφακτής*) and implies that he performed abortions. Gynaecological issues are also addressed in his *Against Common Opinions* (*Πρὸς τὰς κοινὰς δόξας*): menstruation is helpful to some women, harmful to others (see ABORTION; GYNAECOLOGY; MIDWIVES).

His semiotic system, known as a 'triple-timed inference from signs' (*τρίχρονος σημείωσις*), his descriptions of causes and symptoms of many physical and mental disorders, and his threefold classification of dreams are among many further achievements that provoked both acclaim and polemical responses throughout antiquity. See ANATOMY AND PHYSIOLOGY; MEDICINE, § 5. 1.

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